

# PRIMEFOCUS

Tri-Valley Stargazers



October 2012



## Meeting Info

### What:

Part 1: The Astronomical League: Observing Projects and More

Part 2: Show and Tell

### Who:

Bob Jardine

### When:

October 19, 2012

Doors open at 7:00 pm

Featured Speaker at 7:30 pm

Show and Tell, afterward

### Where:

Unitarian Universalist Church in Livermore  
1893 N. Vasco Road

## Inside

|                                |   |
|--------------------------------|---|
| News & Notes                   | 2 |
| Observing Challenge            | 2 |
| Calendar of Events             | 3 |
| What's Up                      | 6 |
| NASA Space Place               | 7 |
| Membership/Renewal Application | 8 |

## October Meeting

### The Astronomical League: Observing Projects and More

Bob Jardine

The Astronomical League comprises over two hundred and forty local amateur astronomical societies from all across the United States. These organizations, along with Members-at-Large, Patrons, and Supporting members form one of the largest amateur astronomical organizations in the world. This talk will introduce you to the Astronomical League, our chapter club, TAC-AL, and to some of the League's many interesting and varied observing projects.



Bob Jardine is a software engineer at Google. He has been an active amateur astronomer for a dozen or so years. He serves as the "coordinator" (the only club officer) for the TAC-AL club, which is a Bay-area member club of the Astronomical League.

### Show & Tell: Astronomical League Observing/Imaging Programs

Maybe you've completed observing the Messier list, or even the Herschel 400. Come share your experience with progress and/or your interest in completing an observing or imaging program. Check out the Astronomical League projects at: <http://www.astroleague.org/al/obsclubs/AlphabeticObservingClubs.html> You'll be amazed at the variety of programs to challenge your skills, and improve your knowledge of the sky. Have fun, I know I will!

## News & Notes

### 2012 TVS Meeting Dates

The following lists the TVS meeting dates for 2012. The lecture meetings are on the third Friday of the month, with the Board meetings on the Monday following the lecture meeting.

| Lecture Meeting | Board Meeting | Prime Focus Deadline |
|-----------------|---------------|----------------------|
| Oct. 19         | Oct. 22       |                      |
| Nov. 16         | Nov. 19       | Nov. 02              |
| Dec. 21         | Dec. 24       | Dec. 07              |
| Jan. 18         | Jan. 21       | Jan. 04              |
| Feb. 15         | Feb. 18       | Feb. 01              |
| Mar. 15         | Mar. 18       | Mar. 01              |
| Apr. 19         | Apr. 22       | Apr. 05              |
| May 17          | May 20        | May 03               |
| Jun. 21         | Jun. 24       | Jun. 07              |
| Jul. 19         | Jul. 22       | Jul. 05              |
| Aug. 16         | Aug. 19       | Aug. 02              |
| Sep. 20         | Sep. 23       | Sep. 06              |
| Oct. 18         | Oct. 21       | Oct. 04              |
| Nov. 15         | Nov. 18       | Nov. 01              |
| Dec. 20         | Dec. 23       | Dec. 06              |

### Money Matters

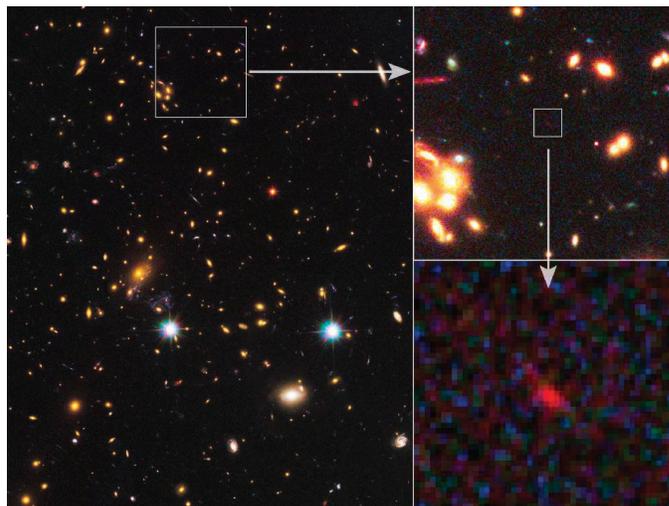
Treasurer David Feindel indicates that as of July 8, 2012 the TVS checking account balance is \$12,302.78

## Journal Club by Ken Sperber

### 2 (Actually 3) Telescopes are Better than One

So, you want to study the first stars and galaxies that formed after the Big Bang to learn how the stars formed and evolved, and how nascent dwarf galaxies merged and transitioned into the distribution of galaxies we observe in the present universe. Being ever so curious, you also want to learn about the era of re-ionization, that is the time when the light from the first stars and galaxies ended the dark ages by causing neutral hydrogen to lose an electron. This process of ionization continues to this day.

What's an astronomer to do, when the only telescope with the necessary sensitivity to see these first objects, the James Webb Space Telescope, will not launch for another 5+ years? Well, if you are a theoretical astronomer/physicist you can develop numerical models that predict how the first stars and galaxies should evolve. Barring that, mother nature might come to the rescue. As predicted by the general theory of relativity, massive clusters of galaxies can act as a gravitational lens. As the light from a more distant object passes the intervening cluster, the light rays are refocused by the



Caption: In the big image at left, the many galaxies of a massive cluster called MACS J1149+2223 dominate the scene. Gravitational lensing by the giant cluster brightened the light from the newfound galaxy, MACS 1149-JD, some 15 times. At upper right, a partial zoom-in shows MACS 1149-JD in more detail, and a deeper zoom appears to the lower right. Image credit: NASA/ESA/STScI/JHU

warping of space-time, with the result that the gravitational lens “can significantly magnify the brightness and sizes of galaxies far behind them, thereby revealing morphological details that are otherwise impossible to detect” (Zheng et al. 2012).

Zheng et al. (2012) used the Hubble Space Telescope (HST) and the Spitzer (Infrared) Space Telescope (SST) to make multi-band observations of the galaxy cluster MACS1149+2223. This observation was part of a systematic observing program called “The Cluster Lensing and Supernova survey with Hubble (CLASH). Images were obtained in 16 broad bands between 0.2-1.7 microns. The new found object, MACS1149-JD, was only seen in the four longest wavelength (reddest) wavelengths from HST, and in one SST band. The authors found that the Hydrogen Lyman-alpha break and the Hydrogen Balmer break to be redshifted into the infrared by a factor of 9.6 ( $z=9.6$ ), which corresponds to an age of 500 million years after the Big Bang. Normally, galaxies at this distance are expected to be dimmer than 29th magnitude. This is dimmer than the galaxies that were imaged in the Hubble Ultra-Deep field. The gravitational lens brightened the image of this galaxy by about a factor of 15, making this investigation possible.

With HST data only, there were viable solutions that placed MACS1149-JD at  $z=2 - 6$ . With the inclusion of the SST data, the only viable solution placed the distance at  $z=9.6$ . Based on the area surveyed, the authors estimate that there are a sufficient number of ancient galaxies to dominate reionization.

Read more: see Zheng et al. (2012, Nature, 489, 406-408, doi:10.1038/nature11446), and <http://www.universetoday.com/97456/early-galaxy-found-from-the-cosmic-dark-ages/>

Header Image: Astronomical League Patch. For more information on the Astronomical League and its many resources, see: <http://www.astroleague.org/>

# Calendar of Events

## October 17, Noon-1:00pm

**What:** Climate Change: What's Going On With the Sun?  
**Who:** Dan Lubin, SETI Institute  
**Where:** SETI Headquarters, 189 N. Bernardo Ave.,  
Mountain View, CA  
**Cost:** Free

Throughout the past century, while greenhouse gas (GHG) abundances have been steadily increasing and influencing Earth's climate, the Sun has remained relatively bright and quiescent. Solar cycles have been steadily active, with instantaneous sunspot numbers at solar maximum exceeding 100 in every cycle since 1893 (Cycle 13). The climate warming we have experienced since the beginning of the modern industrial era cannot be attributed to the Sun. However, the recent minimum between Cycles 23 and 24, and NASA predictions of a substantially lower sunspot number at the 2013 solar maximum, suggest that the Sun's recent bright and quiescent period may be ending. Both autocorrelation studies of recent solar cycles, and studies of solar analogs in nearby field stars, suggest a >40% chance of the Sun entering a new Maunder Minimum sometime in the Twenty First Century. During the historical Maunder Minimum (1645-1715), meteorological data from Europe and proxy records from global oceans indicate a substantially cooler climate, attributable to decreased solar irradiance. In our lifetime, we may therefore see a period of solar dimming in conjunction with increasing GHG abundances. A new Maunder Minimum would not entirely offset the projected GHG-induced warming (the GHG radiative forcing is at least three times larger than best estimates of the solar irradiance decrease). Instead, the complex interactions between radiative balance and atmospheric dynamics yield unusual regional patterns of pronounced warming versus cooling. This seminar will address the physical basis of cli-

mate change in the context of both GHG and solar variability, and will also extend the discussion to the influence of stellar variability upon habitable zones.

For more information see: <http://www.seti.org/csc/lectures>, e-mail [info@seti.org](mailto:info@seti.org), or phone 650-961-6633.

## October 20, 7:00pm

**What:** MSL and the Search for Organics on Mars  
**Who:** Dr. Chris McKay NASA-Ames Research Center  
**Where:** Mt. Tamalpais State Park, Cushing Memorial Amphitheater, more commonly known as the Mountain Theater, Rock Spring parking area  
**Cost:** Free

NASA's Mars Science Laboratory will arrive on the red planet in August. How can the mission's rover, Curiosity, with unprecedented research tools to study the early environmental history of Mars, contribute to the search for evidence of life on Mars.

For more information see: <http://www.mttam.net/astronomy/schedule.html>

## October 24, Noon-1:00pm

**What:** Abiotic Nitrogen on Earth Like Planets: Habitability and the Origin of Life  
**Who:** David Summers, SETI Institute  
**Where:** SETI Headquarters, 189 N. Bernardo Ave.,  
Mountain View, CA  
**Cost:** Free

Abstract pending.

For more information see: <http://www.seti.org/csc/lectures>, e-mail [info@seti.org](mailto:info@seti.org), or phone 650-961-6633.

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### **Eyes on the Skies**

Eyes on the Skies is a robotic solar telescope run by Mike Rushford ([rushford@eyes-on-the-skies.org](mailto:rushford@eyes-on-the-skies.org)). You may access it by visiting [www.eyes-on-the-skies.org](http://www.eyes-on-the-skies.org).

### **TVS E-Group**

So how do you join the TVS e-group, you ask? Just send an e-mail message to the TVS e-mail address ([trivalleystargazers@gmail.com](mailto:trivalleystargazers@gmail.com)) asking to join the group. Make sure you specify the e-mail address you want to use to read and post to the group.

## Calendar of Events (continued)

### October 26, 6:00-9:00pm

What: Star Party  
Who: You  
Where: Chabot Space & Science Center, 10000 Skyline Blvd., Oakland, CA 94619  
Cost: Included with General Admission, RSVP recommended, register online or call (510) 336-7373

Hike through the redwoods in twilight and moonlight on a moderately strenuous 4-5 mi hike. Trail walks are led by an experienced hiker and Chabot educator and feature discussions about the natural environment and events and objects in the sky. Hike will take place rain or shine.

For more information see: <http://www.chabot.space.org/events.htm>

### October 27, 10:00am-10:00pm

What: The Haunted Hallows  
Who: You  
Where: Chabot Space & Science Center, 10000 Skyline Blvd., Oakland, CA 94619  
Cost: Included with General Admission, RSVP recommended, register online or call (510) 336-7373

Explore the dark side of Chabot Space & Science Center with a night of spooky, ghoulish fun. Visit the Potions Lab, Electric Zone, The Laser Maze and The Haunted House. Activities will take place from 6pm - 9pm.

For more information see: <http://www.chabot.space.org/events.htm>

### October 27, 7:00pm and 8:30pm

What: Night Hike: Frightening Forest  
Who: You  
Where: Chabot Space & Science Center, 10000 Skyline Blvd., Oakland, CA 94619  
Cost: \$10, Does NOT include General Admission, RSVP recommended, register online or call (510) 336-7373

Explore the dark side of Chabot Space & Science Center with a night of spooky, ghoulish fun. Visit the Potions Lab, Electric Zone, The Laser Maze and The Haunted House. Activities will take place from 6pm - 9pm.

For more information see: <http://www.chabot.space.org/events.htm>

### October 30, 5:30pm

What: Night Hike: Moon Rising  
Who: You  
Where: Chabot Space & Science Center, 10000 Skyline Blvd., Oakland, CA 94619  
Cost: \$10, Does NOT include General Admission, RSVP recommended, register online or call

(510) 336-7373

Our regular night hikes get a special flare tonight courtesy of the Universe. We'll head out a bit earlier, hiking in the sunset, and stop to watch the moon rise in the night sky. This moderately strenuous 4-5 mile trek features discussions about the natural environment, celestial events, and objects in the sky.

For more information see: <http://www.chabot.space.org/events.htm>

### October 31, Noon-1:00pm

What: Close-in Planets: From Hot Jupiters to Super Moons  
Who: Eugene Chiang, UC Berkeley  
Where: SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA  
Cost: Free

The closest-in planets, with periods as short as 10 hours, are now a well-established population, thanks to Doppler and transit surveys. They present a number of challenges: how did they form and achieve their tight orbits, and how do they evolve and survive in the face of intense irradiation from their parent stars? Although orbital migration is often invoked, the possibility of in-situ accretion deserves consideration, and Dr. Chiang will review how rocky cores coagulate and acquire gaseous envelopes at the smallest disk radii. In some cases, gas envelopes are susceptible to evaporation, and Dr. Chiang will describe how close-in planets lose mass via thermal winds driven by stellar heating. The curious case of Kepler Input Catalog 12557548 --- which may represent the first example of a geologically active, Moon-sized planet in its final death throes --- will be presented.

For more information see: <http://www.seti.org/csc/lectures>, e-mail [info@seti.org](mailto:info@seti.org), or phone 650-961-6633.

### November 2, 6:00-7:30pm

What: Strange New Worlds: The Search for Alien Planets and Life Beyond our Solar System  
Who: Prof. Ray Jayawardhana  
Where: Chabot Space & Science Center, 10000 Skyline Blvd., Oakland, CA 94619  
Cost: \$25.50 online, RSVP recommended, register online or call (510) 336-7373

Soon astronomers expect to find alien "Earths" by the dozens in orbit around distant suns. Before the decade is out, telltale signs that these planets harbor life may be found. If they are, the ramifications for all areas of human thought - from religion and philosophy to art and biology - will be breathtaking. In Strange New Worlds, renowned astronomer Ray Jayawardhana brings news from the front lines of the epic quest to find planets - and alien life - beyond our solar system.

## Calendar of Events (continued)

For more information see: <http://www.chabotspace.org/events.htm>

### November 3, 7:00pm

**What:** When Worlds Collide & A View of the Heavens  
**Who:** Dr. Kevin Zahnle,  
**Where:** Mt. Tamalpais State Park, Cushing Memorial Amphitheater, more commonly known as the Mountain Theater, Rock Spring parking area  
**Cost:** Free

Planetologist Dr. Zahnle reminds us that the famous K/T extinction event (death knell of the dinosaurs) shows that, even today, the collision of Earth with a small world gone astray can refresh the face of our planet. Impacts were much larger and more frequent on the early Earth. In all likelihood, impacts posed the greatest challenge to the survival of early life; and they remain a major threat, today.

Enjoy a short "sky tour" of the night sky from the Mountain Theatre. Following the Q&A at the end of each talk, those in the audience not familiar with the night are invited to stay a few minutes while Paul Salazar, the Urban Astronomer, points out bright objects and constellations. Check out Paul's blog: <http://urbanastronomer.blogspot.com/> then come up to the Mountain and join his monthly sky tours. You can also catch his sky tours on the grass roof of the California Academy of Sciences on Thursday evenings.

The perfect ending to the evening is viewing through the telescopes provided by the San Francisco Amateur Astronomers in the Rock Springs Park Lot. These dedicated volunteers are a treasure trove of information which they willingly share. What a great way to give the youngsters in your life a truly stellar experience!

Also NEW is a Mt Tam Astronomy facebook page:

<http://www.facebook.com/pages/Mt-Tam-Astronomy/195684910537344> Don't just join us, but share your spacey thoughts

### November 5, 7:30pm

**What:** The History of Planetariums as the Morrison Turns 60!  
**Who:** Jordan D. Marché II, Ph.D., University of Wisconsin – Madison  
**Where:** California Academy of Science, 55 Music Concourse Dr., Golden Gate Park, San Francisco, CA  
**Cost:** Adults \$12, Seniors \$10, Academy members \$6. Reserve a Space Online or call 415-379-8000

Join us as we celebrate the 60th birthday of the Academy's Morrison Planetarium with a special presentation and look back through our dome's history and the history of planetariums across the country. Dr. Marché will lead us on a

journey back in time from the early days of the Morrison through to the modern era and explore how the use of these facilities has changed over time. Planetariums have informed and inspired audiences of all ages about the wonders and mysteries of the universe for almost 90 years. How did they come to be, and how have they charted their approaches to science education and even entertainment during that time? As a historian of science, Marché will describe the major threads of planetarium history, including creation of Morrison Planetarium 60 years ago, which hosted the first planetarium light shows in the late 1950s. More than an account of evolving projection technologies, his talk will examine how the community of planetarium educators organized in response to broader social changes including the dawning space age.

See <http://www.calacademy.org/events/lectures/> for lecture and reservation information.

### November 6, 7:00pm

**What:** The Evolution of Terrestrial and Extraterrestrial Life: A Theological Assessment  
**Who:** Ted Peters, Pacific Lutheran Theological Seminary  
**Where:** SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA  
**Cost:** Free

The set of assumptions that generates progressive research programs associated with the search for extra-terrestrial life--especially intelligent life--constitute a myth-like picture of reality. Specifically, the set of assumptions frequently include (1) placing the origin of life within the theory of evolution [Darwinian evolution describes speciation, not the origin of life]; (2) importing the doctrine of progress into biology so that simple organisms are allegedly destined to evolve into intelligent organisms [the dominant view among evolutionary biologists is that no direction or purpose or progress is discernible in evolution]; (3) presuming that an extra-solar planet with a longer evolutionary history is likely to have developed higher intelligence; (4) positing that high intelligence leads to the development of science; and, finally, (5) asserting that advanced science leads to advances in all quarters of life so that highly evolved extraterrestrial intelligences may have achieved prosperity, medical perfection, long life, societal peace, and a benevolent or altruistic ethic.

This worldview exhibits uncanny resemblances to the ancient gnostic-redeemer myth, minus the mysticism. The future may prove that these scientific assumptions have been valid, to be sure; however, in the meantime, pointing out their inherent mythical structure may illuminate the way we terrestrials think.

continued at the bottom of p. 6

## What's Up by Ken Sperber (adapted from S&T and The Year in Space)

Pacific Daylight Time until November 4; Pacific Standard Time thereafter

### October

- 13-27 Sat- Zodiacal light visible in the east (~2 hours before sunrise)
- 15 Mon New Moon (5:02am)**
- 17-18 Wed- Crescent Moon near Mars and Antares, low in the west (Dusk)
- 18-22 Thur- Mars passes a few degrees above Antares, compare these similarly colored objects (45-90 minutes after sunset)
- 20-22 Sat- Orionid Meteor Shower (best am-predawn, see October S&T, p. 50)
- 21 Sat First Quarter Moon (8:32pm)**
- 26 Fri Mercury at greatest elongation (30 minutes after sunset)
- 27 Sat Uranus 5 degrees south of the Moon
- 29 Mon Full Moon (12:49pm)**

### November

- 1 Thu Jupiter about 1 degree north of Moon (see Nov. S&T, p. 50)
- 3-4 Sat- Taurid Meteor Shower (best am-predawn)
- 4 Sun Pacific Standard Time Begins at 2am (set clocks back 1 hour)
- 6 Tue Last Quarter Moon (4:36pm)**
- 11 Sun Venus 5 degrees and Spica 1 degree north of Moon
- 12 Mon Saturn 4 degrees north of Moon
- 13 Tue New Moon (2:08pm)**
- 14 Wed Moon at perigee
- 15 Thu Venus 4 degrees north of Spica
- 16 Fri Mars 4 degrees and Pluto 0.1 degrees south of Moon
- 17-18 Sat Leonid Meteor Shower (best am-predawn)
- 20 Tue First Quarter Moon (6:31am)**
- 23 Fri Uranus 5 degrees south of the Moon

For more information see: <http://www.seti.org/csc/lectures>, e-mail [info@seti.org](mailto:info@seti.org), or phone 650-961-6633.

#### November 13, 12:00pm

What: Climate Change Impacts in the Arctic Ocean  
Who: Kevin Arrigo, Stanford University  
Where: SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA  
Cost: Free

Sea ice in the Arctic Ocean is in rapid decline. This reduction in ice extent and thickness has resulted in a longer open water season and higher marine productivity. Until recently, phytoplankton blooms on continental shelves were thought to be restricted to waters free of sea ice. However, during the summer of 2011 in the Chukchi Sea, a large phytoplankton bloom was observed for the first time beneath fully consolidated pack ice and extended from the ice edge to >100 km

into the pack. This has been made possible by a thinning sea ice cover with more numerous melt ponds over the past decade that has enhanced light penetration through the sea ice into the upper water column.

These and other observations suggest that phytoplankton blooms are currently widespread on nutrient-rich Arctic continental shelves and that past estimates of annual primary production in waters where under-ice blooms develop are ~10-fold too low. These massive phytoplankton blooms represent a marked shift in our understanding of Arctic marine ecosystems and their early timing can potentially disrupt life cycle strategies of both resident and migratory Arctic species.

For more information see: <http://www.seti.org/csc/lectures>, e-mail [info@seti.org](mailto:info@seti.org), or phone 650-961-6633.



## Doing Science with a Spacecraft's Signal

By David Doody

Mariner 2 to Venus, the first interplanetary flight, was launched August 27 fifty years ago. This was a time when scientists were first learning that Venus might not harbor jungles under its thick atmosphere after all. A Russian scientist had discovered that atmosphere during the rare Venus transit of 1761, because of the effects of sunlight from behind.

Mariner 2 proved interplanetary flight was possible, and our ability to take close-up images of other planets would be richly rewarding in scientific return. But it also meant we could use the spacecraft itself as a "light" source, planting it behind an object of our choosing and making direct measurements.

Mariner 4 did the first occultation experiment of this sort when it passed behind Mars as seen from Earth in July 1965. But, instead of visible light from the Sun, this occultation experiment used the spacecraft's approximately 2-GHz radio signal.

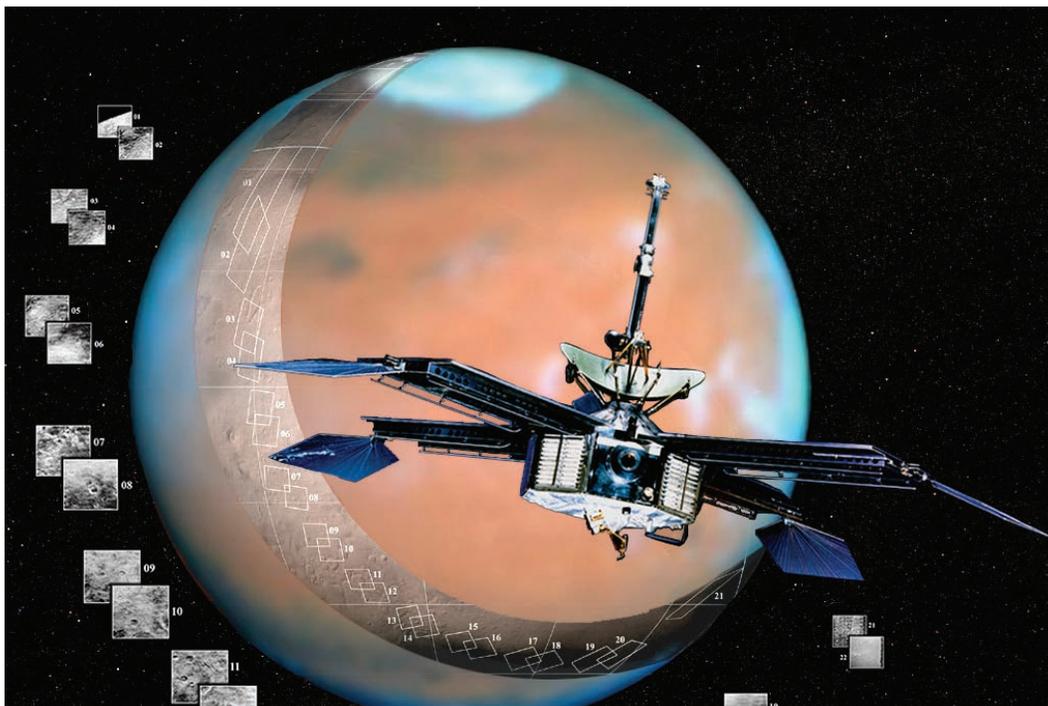
The Mariner 4 experiment revealed Mars' thin atmosphere. Since then, successful radio science occultation experiments have been conducted at every planet and many large moons. And another one is on schedule to investigate Pluto and its

companion Charon, when the New Horizons spacecraft flies by in July 2015. Also, during that flyby, a different kind of radio science experiment will investigate the gravitational field.

The most recent radio science occultation experiment took place September 2, 2012, when the Cassini spacecraft carried its three transmitters behind Saturn. These three different frequencies are all kept precisely "in tune" with one another, based on a reference frequency sent from Earth. Compared to observations of the free space for calibration just before ingress to occultation, the experiment makes it possible to tease out a wide variety of components in Saturn's ionosphere and atmosphere.

Occultation experiments comprise only one of many categories of radio science experiments. Others include tests of General Relativity, studying the solar corona, mapping gravity fields, determining mass, and more. They all rely on NASA's Deep Space Network to capture the signals, which are then archived and studied.

Find out more about spacecraft science experiments in "Basics of Space Flight," a website and book by this author, <http://www2.jpl.nasa.gov/basics>. Kids can learn all about NASA's Deep Space Network by playing the "Uplink-Downlink" game at <http://spaceplace.nasa.gov/dsn-game>.



In this poster art of Mariner 4, you can see the parabolic reflector atop the spacecraft bus. Like the reflector inside a flashlight, it sends a beam of electromagnetic energy in a particular direction. Credit: NASA/JPL/Corby Waste.

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## PRIMEFOCUS

### Tri-Valley Stargazers Membership Application

Member agrees to hold Tri-Valley Stargazers, and any cooperating organizations or landowners, harmless from all claims of liability for any injury or loss sustained at a TVS function.

Name \_\_\_\_\_ Phone \_\_\_\_\_ e-mail \_\_\_\_\_

Address \_\_\_\_\_

Do not release my: \_\_\_\_\_ address, \_\_\_\_\_ phone, or \_\_\_\_\_ e-mail information to other TVS members.

- Membership category:
- \_\_\_\_\_ \$5 Student.
  - \_\_\_\_\_ \$30 Basic. You will receive e-mail notification when the PDF version of Prime Focus is available for download off the TVS web site.
  - \_\_\_\_\_ \$10 Hidden Hill Observatory (H2O) yearly access fee. You need to be a key holder to access the site.
  - \_\_\_\_\_ \$20 H2O key holder fee. (A refundable key deposit—key property of TVS).
  - \_\_\_\_\_ \$40 Patron Membership. Must be a member for at least a year and a key holder.
  - \_\_\_\_\_ \$34 One year subscription to Astronomy magazine.
  - \_\_\_\_\_ \$60 Two year subscription to Astronomy magazine.
  - \_\_\_\_\_ \$32.95 One year subscription to Sky & Telescope magazine. Note: Subscription to S&T is for new subscribers only. Existing subscribers please renew directly through S&T.
  - \$ \_\_\_\_\_ Tax deductible contribution to Tri-Valley Stargazers.
  - \$ \_\_\_\_\_ TOTAL – Return to: Tri-Valley Stargazers, P.O. Box 2476, Livermore, CA 94551

Membership information: Term is one calendar year, January through December. Student members must be less than 18 years old or still in high school.